24/10/2015

سكشن 15 من 12:15 لـ 2 ع

AMR

M.r

(9)

sheet (2) Fluid Properties

Dimension: is used to describe the basic concept like: Mass, length, time and temperature.

unit: ~~are~~ are the means of expressing the value of dimension numerically.

length is dimension but centimeters and inches are both numerical units.

unit systems

BG النظام الإنجليزى	EE	SI النظام العالمى
British gravitational or English system.	English Engineering	international system.
Ft	Ft	m
slug	lb_m	kg
s	s	s
R	R	k

$\boxed{b}$

$1\,ft = 0.3048\ m$

$1\,in = 25.4\ mm = 25.4 \times 10^{-3}\ m$

$1\ slug = 14.59\ Kg$

$1\ lbf = 4.448\ N$

$1\ slug = 32.174\ lbm$

1 gallon (uK) = 4.546 litre

1 gallon (us) = 3.785 litre.

$g = 9.81\ m/s^2 = 32.174\ ft/s^2$

$\rho_{H_2O} = 1000\ Kg/m^3 = 1.94\ slug/ft^3$

$1\ hp = 735\ watt$

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sheet ② No. $\boxed{1}$ $\gamma = 46.5\ lb/ft^3$

what ⓐ ρ $\boxed{b}$ ν ⓒ S.G.

solution

Notes

$\boxed{\rho = \frac{m}{V}} \rightarrow Kg/m^3$

$\boxed{S.G = \frac{\rho}{\rho_{H_2O}}}$ liquid

$\boxed{S.G = \frac{\rho}{\rho_{air}}}$ Gas

$\boxed{\text{sp weight } (\gamma) = \rho g = \frac{W}{V}}$ $\boxed{N/m^3}$

W = mg

Solution

$\boxed{c}$

$\gamma = \rho . g$

$46.5 = \rho * 32.174$

$\rho = // \quad slug/ft^3$

$v = \frac{1}{\rho} = \frac{1}{....} = // \quad ft^3/slug$

$S.G = \frac{\rho}{\rho_{H_2O}} = \frac{....}{1.94}$

sheet $\boxed{2}$ No. $\boxed{2}$

$m = 2$ slug $\longrightarrow g = 32.174 \; ft/s^2$

$m = ??$ $\longrightarrow g = 30 \; ft/s^2$

but
- $\rightarrow$ mass is constant.
- $\rightarrow w = m * g$ متغير

sheet $\boxed{2}$ No. $\boxed{3}$

weight = 100 lb_f

Determin (a) $w = ?? \; N$ $\boxed{b}$ $m = ?? \; kg$.

(c) $a = ?? \; ft/s^2 = ?? \; m/s^2 \xrightarrow{at} \Sigma F = 50 \; lb_f$

Solution

$w = 100 * 4.448 = 4448 \; N$

$m = \frac{444.8}{9.81} = 44.48 \; kg$

$\boxed{d}$

$$\underset{\text{Ibf / N}}{\Sigma F} = \underset{\text{slug / kg}}{m}\, \underset{\text{Ft/s}^2\text{ / m/s}^2}{a}$$

$$\Sigma F = 50\ \text{Ibf} = \frac{44.48\ \text{kg}}{14.59} * a$$

$$a = \underline{\underline{JJ}}\ \text{Ft/s}^2$$

$$50 * 4.448 = 44.48 * a$$

$$a = JJ\ \text{m/s}^2$$

	MLT	FLT
mass	M	$FL^{-1}T^{2}$
Length	L	L
time	T	T
Force	MLT^{-2}	F
velocity	LT^{-1}	LT^{-1}
Pressure	$ML^{-1}T^{-2}$	FL^{-2}
work	$ML^{2}T^{-2}$	$F*L$

e

No. 4

Data	MLT	FLT
a Force * volume	ML^4T^{-2}	FL^3
b $\frac{\text{Pressure * Mass}}{\text{Area}}$	$\frac{ML^{-1}T^{-2} * M}{L^2} = M^2L^{-3}T^{-2}$	$\frac{FL^{-2} * FL^{-1}T^2}{L^2} = F^2L^{-5}T^2$
c $\frac{\text{Moment}}{\text{velocity}}$	$\frac{ML^2T^{-2}}{LT^{-1}} = MLT^{-1}$	$\frac{FL}{LT^{-1}} = F \cdot T$
d $\frac{\text{Volume * Mass}}{\text{velocity}}$	$\frac{L^3 * M}{LT^{-1}} = ML^2T$	$\frac{L^3 * FL^{-1}T^2}{LT^{-1}} = FLT^3$

No. 7 $\longrightarrow$ SI

a) 4.81 slug = 4.81 * 14.59 = 70.17 kg

b) 3.02 Ib = 3.02 * 4.448 = 13.432 N

c) 73.1 ft/s^2 = 73.1 * 0.3048 = 21.93 m/s^2

d) 0.0234 $\frac{Ib.s}{ft^2} = \frac{0.0234 * 4.448}{(0.304)^2} = 1.156 \frac{N.s}{m^2}$

e) 10.2 in/min $= \frac{10.2 * 25.4 * 10^{-3}}{60} = 4.318 * 10^{-3}$ m/s

F) 79.1 hp = 79.1 * 735 = 58138.5 W

g) 15 gallon (us) = 15 * 3.785 = 56.775 littre

$\boxed{F}$

$1\,m = 3.28\ ft \qquad 1\ kg = 0.068\ slug$

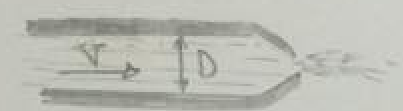
$1\,N = 0.224\ Ibf$

$\boxed{a}$ acceleration $m/s^2 = 3.28\ Ft/s^2$

$\boxed{b}$ Density $Kg/m^3 = \dfrac{1 * 0.068}{(3.28)^3} = vv\ \dfrac{slug}{Ft^3}$

No. $\boxed{5}$

$h = (0.04 \text{ to } 0.09) * \left(\frac{D}{d}\right)^4 * \frac{V^2}{2g}$



energ loss per unit weight

$R.H.S = (0.04 \text{ to } 0.09)\left(\frac{L}{L}\right)^4\left(\frac{L^2T^{-2}}{2\,LT^{-2}}\right) = L$

$L.H.S = \dfrac{\text{Force} * \text{length}}{\text{weight}} = \underline{L}$

$\therefore\ L.H.S = R.H.S = \underline{L}$ ⁂